

Towards Adaptable Post-War Housing

An architecture that uses change for greater significance.

Research Plan



Towards Adaptable Post-War Housing

An architecture that tolerates change while retaining significance.

Research Plan

Student

Bernd de Groot
5452929

Studio

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Studio Tutors

Ana Pereira Roders
Lidwine Spoormans
Telesilla Bristogianni
Uta Pottgiesser

Research Plan Tutor

Rachel Lee

1. Introduction

Even though there are historical examples of adaptability, the modernist movement at the turn of the 20th century was the first to embrace the concept explicitly. The primary driver of social change during the mid-19th century was the Industrial Revolution, which also produced new building materials, building types, and spatial standards. These factors combined to create new urban conditions and the need for structures that could adapt to change.

Adaptability, in contemporary architecture, is defined as the capacity of a building to effectively accommodate the evolving demands of its context, thus maximising its value through life. **(Schmidt III and Austin, 2016)** An architecture with the ability to develop and change, where elements can be configured, allowing changes in spatial, functional, and technological components without building disruptions. In addition, a gap exists between what architecture wants to be—finished and static—and what architecture is—always shifting in form and purpose. Therefore, buildings should be seen as unfinished to meet society's changing needs. **(Schmidt III and Austin, 2016)**

In the case of a re-design, relating the contemporary definition of adaptability to that of modernist post-war housing poses the risk of conflicting values and beliefs. On the one hand, there is a need for buildings to be more adaptable to society's changing functional, technological, and aesthetic needs and extend their value through life. On the other hand, there is the concept of **cultural significance**, which addresses the range of values ascribed to a cultural heritage asset and justifies its designated status **(Avrami et al., 2000)**. **Spoormans and Roders (2020)** propose incorporating a broader range of values and perspectives outside of traditional heritage disciplines. Their findings highlight the diversity of concepts and emphasise the need for complementary characteristics of different types of value and methods. These can highlight heritage potential and help create more attractive and resilient cities.

A post-war housing redevelopment needs to consider the various defining attributes, the values embedded in them, and the fact that the needs of society are always changing. Therefore, this research is interested in the development of post-war architecture towards an architecture that can truly tolerate change while retaining cultural significance.

2. Problem Statement

Modernism's commitment to abstract symbolism gave rise to the concept of "pure form" and the tenet "form follows function." This allowed the architect to easily define the form of a building based on its use or 'what the building wants to be'. **(Jencks, 1973)** Modernist architecture, and therefore post-war housing, is characterised positively by simple cubic form, industrialised, modular construction, and functional separation. But also negatively through mono-functional spaces, neglect of context, style over substance (performance), and the objectification of users. **(Rabeneck & Sheppard, 1973) (Habraken & Teicher, 1998) (Hertzberger, 2005) (Schneider & Till, 2007)** Many of the negative characteristics identified here continue to be prevailing viewpoints today, indicating a lack of evolution towards situating architecture in its true context. **(Schmidt III and Austin, 2016)**

Furthermore, these negative characteristics have an impact on getting a building listed today. According to **Hasche (2016)**, the main challenges in the listing of post-war housing estates as cultural heritage are the fact that potential obsolescence, changed demographics, and rapidly growing demands for energy efficiency, as well as new living standards, all threaten these buildings with demolition or modification before their historic or artistic values can even be recognised. Although parts of the urban design of Amsterdam Nieuw-West have received recognition of significance (protected cityscape), unfortunately, this is not the case for all the architecture of the buildings, of which many have been demolished or transformed without consideration of their potential cultural significance. **(Havinga et al., 2020)** Research on heritage attributes of post-war housing in Amsterdam by **Havinga et al. (2020)** reveals that ten out of seventeen publications address the threat of demolition, either as a current threat or as a threat from the past, due to the state of disrepair and lack of recognition.

Furthermore, the EU is developing extensive refurbishment plans to create a built environment that is carbon neutral by 2050, which will require significant changes to the stock of post-war and modernist buildings in order to respond to the global urgency to be more efficient with resources and the sequestration of carbon require more adaptable buildings. Adaptability can be considered a way to reduce the amount of new construction, (re)activate underutilised building stock, and improve component disassembly and deconstruction, thereby extending the useful life of buildings. **(Schmidt III and Austin, 2016)**

2.1. State-of-the-art, Aims and Objectives

2.1.1. State-of-art

The topic of adaptability is researched in the book *Adaptability: Theory and Practise*, written by **Robert Schmitt III (2016)**, an architect and academic and Senior Lecturer in Architecture at Loughborough University, and co-author **Simon Austin (2016)**, Professor of Structural Engineering at Loughborough University, UK. The book presents a theoretical framework of concepts and models that form a visual narrative that can assist in defining, communicating, creating, and evaluating adaptability through a review of the literature and case studies.

The framework in the book is applicable to all buildings and focuses solely on adaptability. Adaptability can be considered to have ecological and existential value within the framework of **Tarrafa and Pereira Roders (2011)**. The framework by **Schmitt III & Austin (2016)** does not consider other values.

The heritage attributes of post-war housing in Amsterdam Nieuw-West are defined by **Lisanne Havinga, Bernard Colenbrander, and Henk Schellen (2020)** through the Department of the Built Environment, Eindhoven University of Technology in Eindhoven, the Netherlands. Their research uses a literature review and case studies to reveal the significance levels of attributes according to whether or not a sustainable refurbishment requires their preservation.

2.1.2. Aims and Objectives

This research aims to combine existing research methods on adaptability with research methods on attributes and values. By combining these different methods, an integrated approach is created to research post-war housing blocks that considers the various defining attributes of post-war housing blocks and the values embedded in them.

2.2. Research Questions

How can post-war housing be redesigned to be more adaptable while retaining its defining values and attributes to address the changing needs of society?

Sub-question 1:

How can adaptability be spatially defined at the building level?

Sub-question 2:

How adaptable is post-war housing spatially on the building level?

Sub-question 3:

What are the heritage attributes of post-war housing and the values embedded in them?

2.3. Design Questions

Design-question 1:

How can the adaptability of post-war housing be improved, and how does this affect its attributes and values?

Design-question 2:

How can the current needs of society be addressed in the redesign?

3. Theoretical Framework

The framework used for this research is divided into multiple parts: classification of building layers, interpretation of building layers, and re-design.

3.1. Classification

The basis for classification is seeing a building as a series of layers whose interactions define its resistance to change. **Brand (1997)** sees a building as a series of 'shearing layers' that change at different rates (Figure 1). The more layers are connected, the more difficult and expensive it becomes to adapt a building.

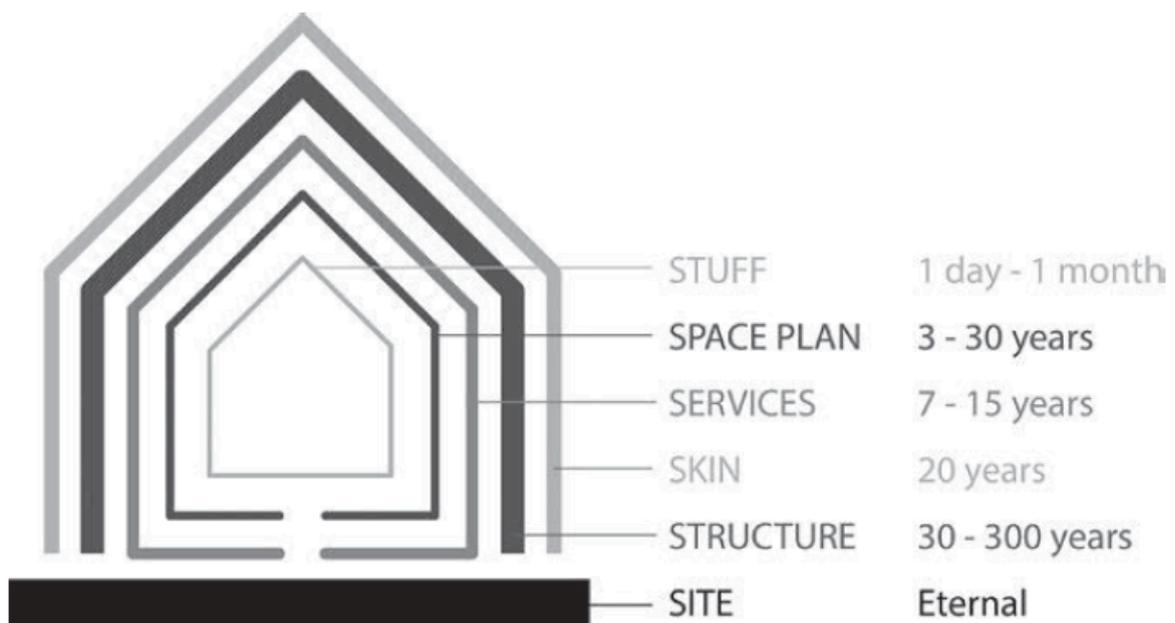


Figure 1: Building Layers Model (Brand, 1997)

Schmitt III & Austin (2016) have modified and expanded Brands' theory. They have added two layers (surroundings and social) to provide a more comprehensive interpretation of the layer concept (Figure 2). These additions are crucial when considering the value of a building throughout its life because in contemporary architecture needs to have the capacity to effectively accommodate the evolving demands of its context. (**Schmitt III and Austin, 2016**) These two additions demonstrate that buildings and their parts cannot be considered in isolation from their context and that users and their social perceptions also shear against the building layers.

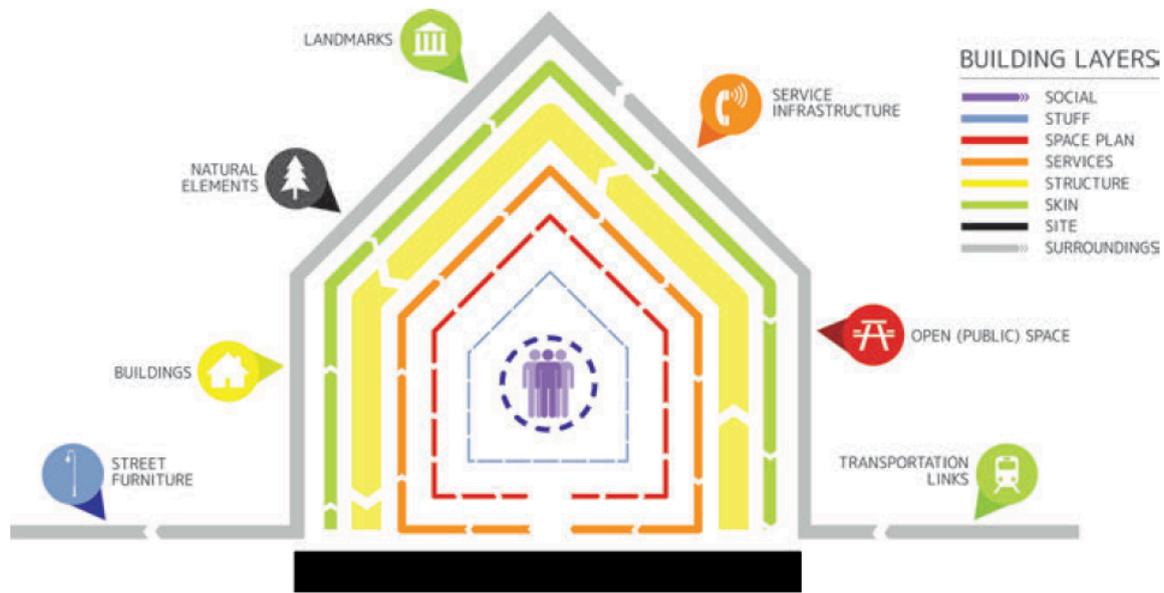


Figure 2: Building Layers Model (Schmitt III & Austin, 2016)

The building will be analysed according to the Building Layers Model by **Schmitt III and Austin (2016)**. The model contains the following eight layers:

- **Surroundings:** the larger context that surrounds a building, encompassing both natural and man-made elements, and extends beyond the boundaries of the building's specific site.
- **Site:** the legal boundary in which the building is situated;
- **Structure:** components that provide horizontal bracing and primary vertical load transfer;
- **Skin:** components that separate the interior spaces from the exterior spaces, physically and visibly;
- **Services:** components that supply and move physical flows, such as water, electricity, communications, and elevators;
- **Space Plan:** components that enclose the spaces that users occupy;
- **Stuff:** components or objects that exist within the space that users occupy;
- **Social:** humans in and around the building who interact with and play a role in the building's life.

Furthermore, the identified components will be classified using **Veldpaus's (2015)** tangible and intangible matrix (Appendix 2). The historical values associated with the chosen attributes will be classified using **Tarrafa and Pereira Roders' (2011)** heritage values taxonomy (Appendix 1).

3.2. Interpretation

Regarding adaptability, the classified elements will be interpreted by placing them in a Dependency Structure Matrix (DSM). A DSM reveals complex interdependencies between the different building systems. According to **Schmitt III & Austin (2016)**, this is crucial for further improvement of a building's adaptability. A DSM is an NxN square cell matrix (Figure 3a) that maps the relationships between elements in a single domain. This research will use a static DSM. Clustering is used to analyse static DSMs, which involves rearranging elements into chunks or modules with a high amount of interaction internally and low interactions externally. (Figure 3b) Another strategic move is to isolate elements with high interactions across multiple chunks and use them as integrating components (**Sharman and Yassine, 2004**).

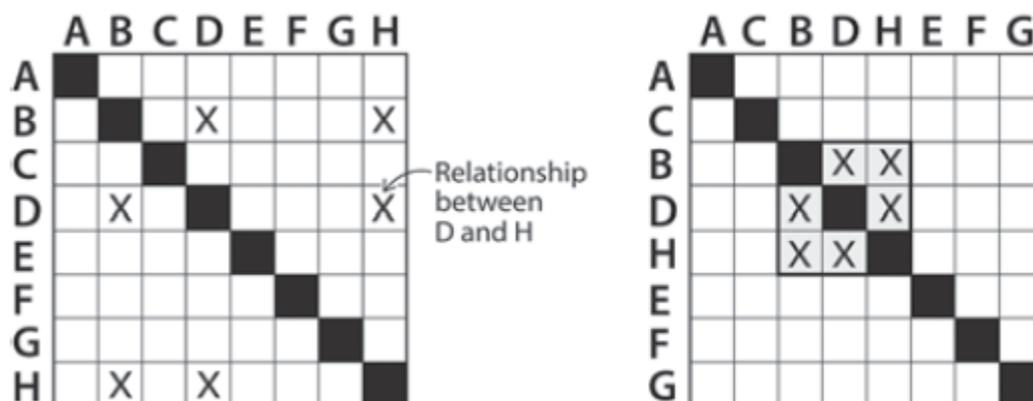
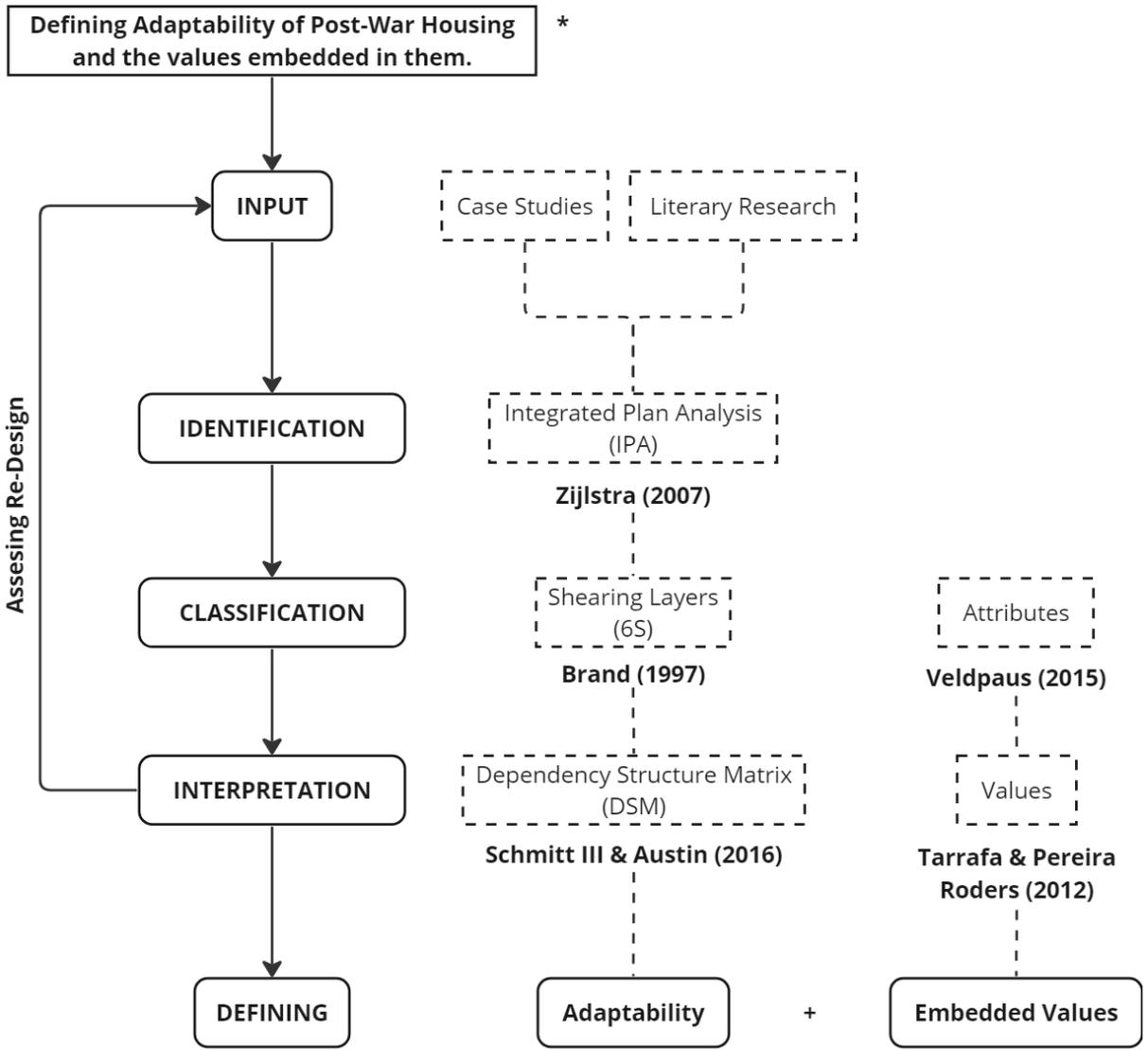


Figure 3a: A DSM composed of eight elements (**Schmidt III and Austin, 2016**)

Figure 3b: A DSM after clustering. (**Schmidt III and Austin, 2016**)

3.3. Re-design and Tactics

Static DSM's can also be used to analyse the impact of change. After the framework has been applied to the case study, the results will form the basis for the redesign. To reveal the impact of change, the redesign will be analysed again using the same framework.



4. Methodology

This chapter explains the research methods used, a description of the design case this research is focused on, the scope of the research, the process, a timeline, and a description of the risks involved and how these are mitigated.

4.1. Case Study

The results of this research are needed to redesign the flats, visible from as far away as three discs, situated on the north side of Amsterdam Nieuw-West (Figure 4). These 13-story-high post-war dwellings are located on the Burgemeester Hoggeurstraat and were built between 1962 and 1964. (**“Burgemeester Hogguerstraat,” 2019**) In the urban design for the Western Garden Cities (UAP), the buildings were intended as an urban development accent on the banks of the Sloterpas. Architect Piet Zandstra embodied the modernist ideology of simple (cubic) form, industrialised and modular construction, and functional separation. In the original design, each building housed 190 apartments spread across thirteen residential floors. In addition, there were two stories containing an office floor on a substructure of garages. (**Gemeente Amsterdam & Zandstra, 1961**)

In recent years, some modifications have been made to the building, including the renovation of external elevators, the replacement of window frames and glazing, and the transformation of the office layer into apartments. (**Gemeente Amsterdam, 2005**)



Figure 4: Three post-war housing blocks located on the Burgemeester Hoggeurstraat (**Zwierstra, 2012**)

4.2. Methods and Sources

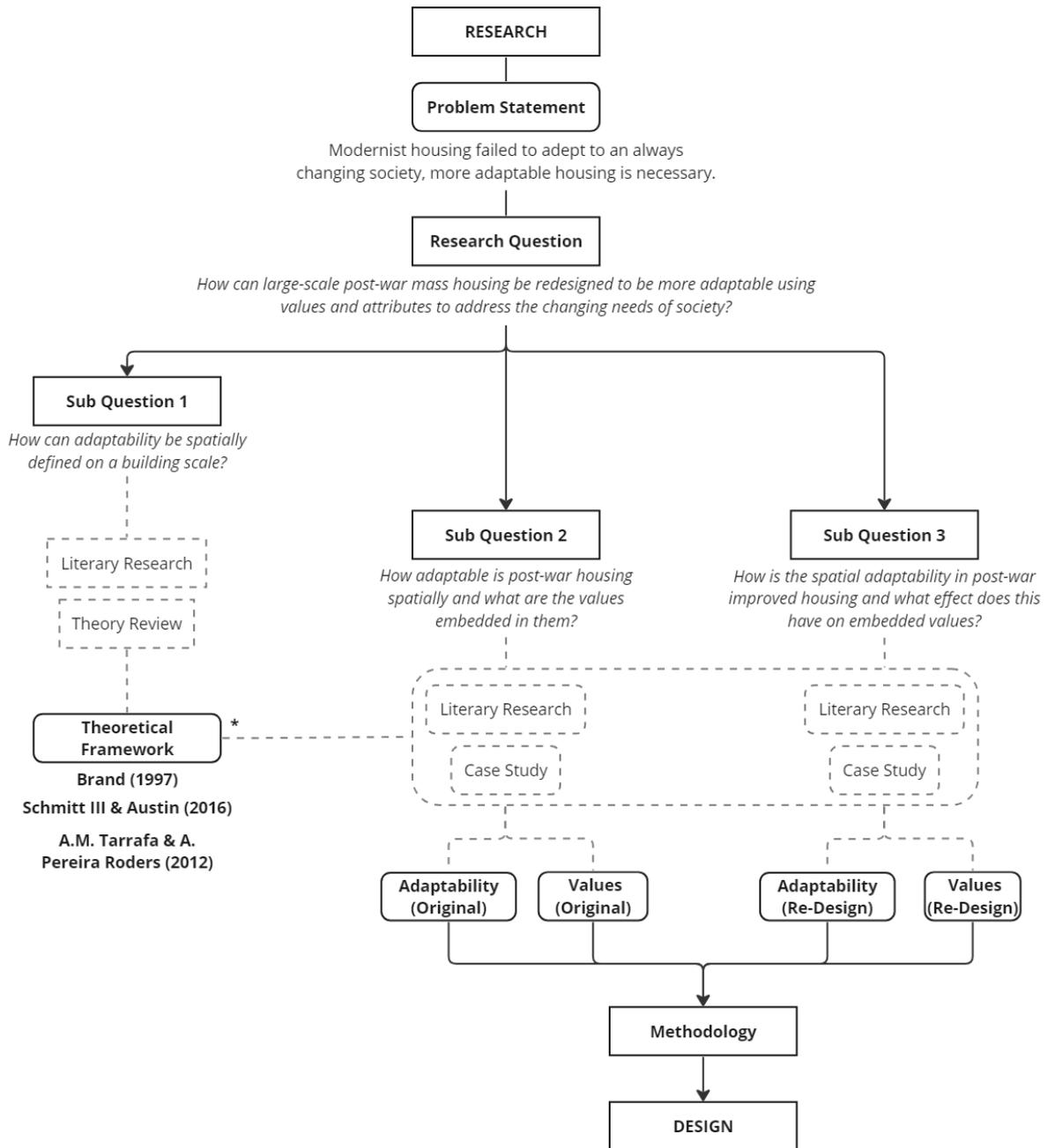
To answer the first sub-question, literature research and a theory review are used to identify the definition of adaptability on the building scale. This results in the theoretical framework mentioned before in Chapter 3.

Answering the second sub-question is done through analysis of the selected case based on the Building Layer Model by **Schmitt III & Austin (2016)**. The data necessary for the analysis consists of historical and contemporary photographs and architectural drawings of the original and current state. The data can be accessed through archives, municipal documents, architects' archives, site visits, and relevant websites. After acquiring the primary data, it is to be reproduced using drawing, 3D-modeling (BIM), and personal writing. The data is then classified and interpreted using a dependency structure matrix.

The third sub-question is answered through historical and contextual analysis of the selected case based on the Building Layer Model by **Schmitt III & Austin (2016)**. The data necessary for the analysis consists of historical and contemporary photographs and architectural drawings of the original and current state. The data can be accessed through archives, municipal documents, architects' archives, heritage status, site visits, and relevant websites. After acquiring the primary and secondary data, it is to be reproduced using drawing, 3D-modeling (BIM), and personal writing. The data is then classified and interpreted using **Veldpaus's (2015)** tangible and intangible matrix (Appendix 2) and **Tarrafa and Pereira Roders' (2011)** heritage values taxonomy (Appendix 1).

4.3. Scope, Process and Timeline

This research takes place from September 11th, 2023, until January 19th, 2024, and is partially divided into a research plan and research paper phase. A smaller part of the research concerning subquestion 1 is already conducted in the research plan phase in the period from September 11th until November 13th, 2023. The remaining part of the research takes place from November 13th until January 19th, 2024. The research is conducted for the largest part using desk research, and a smaller part is conducted through site visits to Amsterdam Nieuw-West (field research). The research follows a chronological plan. To properly manage this research, a timeline was created. (Appendix 3) The results on adaptability and cultural significance are used for redesigning post-war housing blocks located on the Burgemeester Hoggeurstraat in Amsterdam Nieuw-West.



4.4. Risk and Mitigation

To make sure that this research can be completed on time, it is necessary to state the potential risks and how they can be mitigated. Potential risks involved in this research are:

- Not being able to access specific types of data (drawings, literature, photos, etc.) will be mitigated by having multiple case studies available as a backup. In addition, specific selection criteria based on location, age, and accessibility are used for determining the case studies. This will prevent the selection of case studies that are too scarce in their data or provide irrelevant findings.
- The second risk is a potential lack of time, which is mitigated by planning the research process and managing the depth of the research based on the time available.

5. (Preliminary) Results

The preliminary results of this research will be threefold: First, a theoretical framework is presented that can be used to identify the adaptability of a post-war housing block and to define its heritage attributes and the values embedded in them.

Second, the research presents the adaptability of a post-war housing block in a DSM, providing insight into the amount of interaction between the different layers of a building.

Third, this research presents defining attributes and values embedded in the post-war housing block.

6. Bibliography

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Figure 1: Building Layers Model (**Brand, 1997**)

Figure 2: Building Layers Model (**Schmitt III & Austin, 2016**)

Figure 3a: A DSM composed of eight elements. (**Schmidt III and Austin, 2016**)

Figure 3b: A DSM after clustering. (**Schmidt III and Austin, 2016**)

Figure 4: Three post-war housing blocks located on the Burgemeester Hoggeurstraat. (**Zwierstra, 2012**)

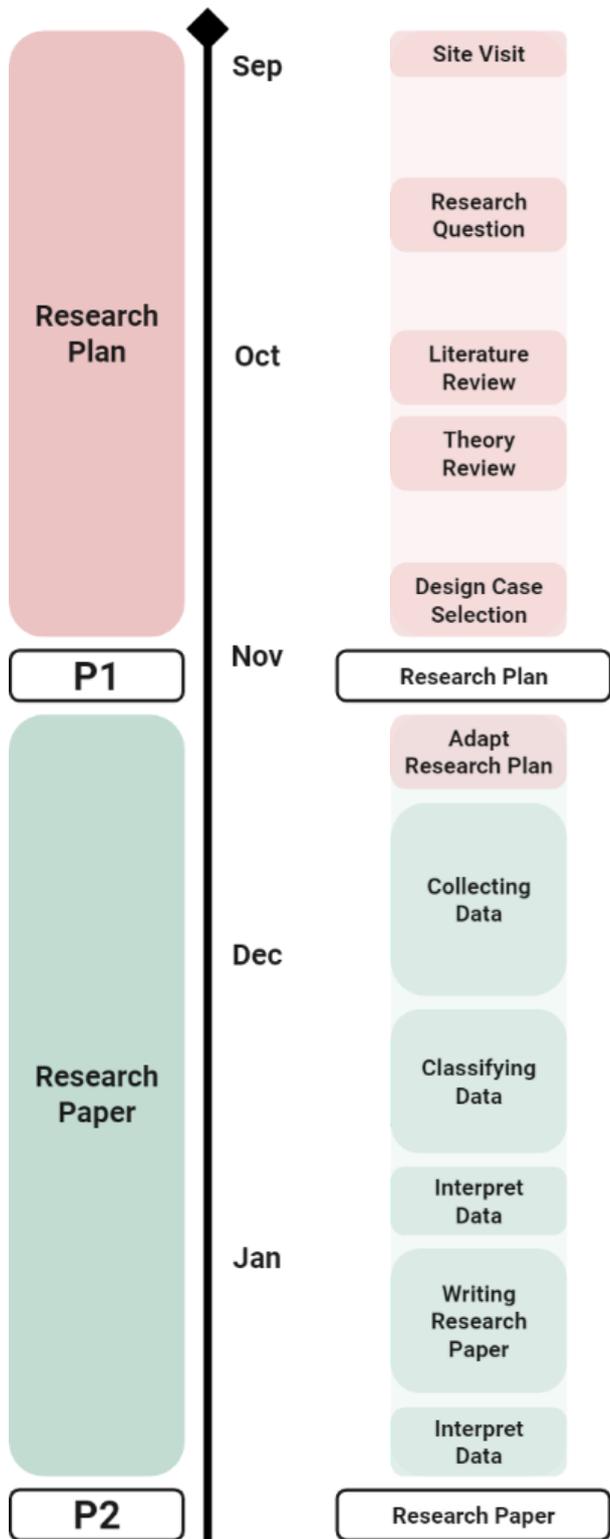
8. Appendix

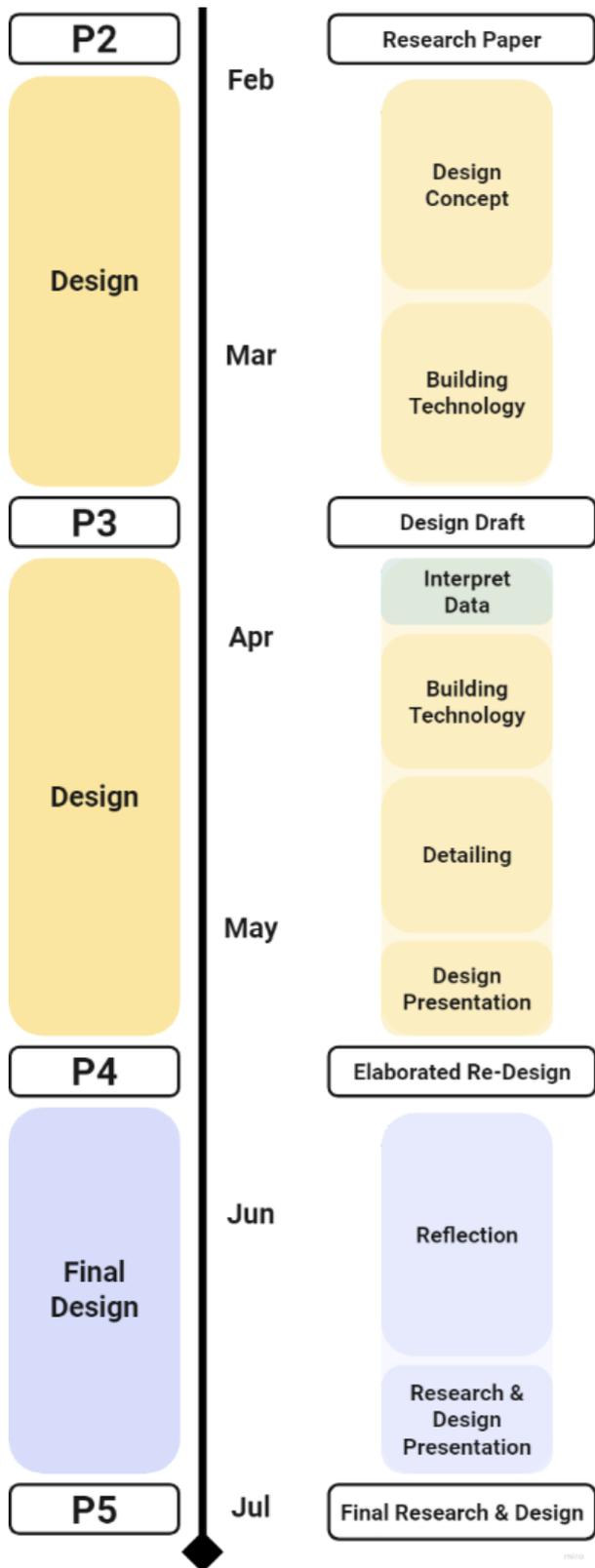
	Secondary Values	References
Social	Spiritual	beliefs, myths, religions (organized or not), legends, stories, testimonial of past generations;
	Emotional, individual	memory and personal life experiences;
	Emotional, collective	notions related with cultural identity, motivation and pride, sense of "place attachment" and communal value.
	Allegorical	objects/places representative of some social hierarchy/status;
Economic	Use	the function and utility of the asset, original or attributed;
	Non-use	the asset's expired function, which has it value on the past, and should be remained by its existence (of materials), option (to make some use of it or not) and bequest value (for future generations);
	Entertainment	the role that might be have for contemporaneous market, mainly for tourism industry;
Political	Allegorical	oriented to publicizing financially property;
	Educational	the education role that heritage assets may play, using it for political targets (e. g. birth-nations myths, glorification of political leaders, etc.);
	Management	made part of strategies and policies (past or present);
	Entertainment	it is part of strategies for dissemination of cultural awareness, explored for political targets;
Historic	Symbolic	emblematic, power, authority and prosperous perceptions stem from the heritage asset;
	Educational	heritage asset as a potential to gain knowledge about the past in the future through;
	Historic-artistic	quality of an object to be part of a few or unique testimonial of historic stylistic or artistic movements, which are now part of the history;
	Historic-conceptual	quality of an object to be part of a few or unique testimonial that retains conceptual signs (architectural, urban planning, etc.), which are now part of history;
Aesthetical	Symbolic	fact that the object has been part/related with an important event in the past;
	Archaeological	connected with Ancient civilizations;
	Artistic	original product of creativity and imagination;
Scientific	Notable	product of a creator, holding his signature;
	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
	Evidential	authentic exemplar of a decade, part of the History of Art or Architecture;
Age	Workmanship	original result of human labour, craftsmanship;
	Technological	skillfulness on techniques and materials, representing an outstanding quality of work;
	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
Ecological	Workmanship	craftsmanship value oriented towards the production period;
	Maturity	piece of memory, reflecting the passage/lives of past generations;
	Existential	marks of the time passage (patine) presents on the forms, components and materials;
Primary values	Spiritual	harmony between the building and its environment (natural and artificial);
	Essential	identification of ecological ideologies on its design and construction;
	Existential	manufactured resources which can either be reused, reprocessed or recycled;

Appendix 1: Tarrafa, S., & Pereira Roders (2011) Primary and Secondary Cultural Values Table Retrieved from

		name	short	Long description	
	0	-	-	There is no attribute mentioned, or the attribute doesn't belong in any of the other attribute	
Intangible	asset related	1	concept	period/style	The intangible attribute is the intended idea, norms, values, expression, style in arts or architecture and the development (phase, evolution) thereof. Often the attribute is related, or represented by, a tangible heritage asset.
		2	relation	relation object-object	The intangible attribute represents a relation with another connected element, location, place or environment. Often the attribute is related, or represented by, a tangible heritage asset.
		3	character	image	The intangible attribute represents defining features, or a specific nature or quality. This can be related to a specific design (e.g. typology, morphology, layout, composition, proportion) or atmosphere (e.g. tranquil, lively, urban, rural).
	societal	4	use	function	The intangible attribute represents a specific (typical, common, special) use or function of a place or environment.
		5	knowledge	traditions, practices or customs	The intangible attribute represents (local) practices, traditions, knowledge, or customs of a community or group. These can be phenomena associated with a place or the understanding of the world by a group of people, which are transmitted and/or repeated and experienced and/or practiced.
		6	association	Relation men-object	The intangible attribute represents human associations with a place, element, location or environment.
		7	community	Society, individuals and their identity	The intangible attribute represents a community or society itself (its members or specific individuals or groups) and/or their cultural identity or diversity.
	process	8	planned	management	The intangible attribute represents an action, change or process that is intentional and planned, determined by strategies and policies (bureaucracy). The attribute often is a more short or medium term process.
		9	unplanned	development or evolution	The intangible attribute represents an action, change or process that is piecemeal, unintentional, spontaneous and natural, without intervention of policies or strategies. The attribute is often a long-term, slow process.
Tangible	asset	10	building element	part of building	The tangible attribute represents elements or parts of a building. This element can be constructive, constitutive or decorative.
		11	building	whole building	The tangible attribute represents a whole building, structure, construction, edifice, or remains that host(ed) human activities, storage, shelter or other purpose.
		12	urban element	part in the urban landscape	The tangible attribute represents elements, parts, components or aspects of/in the urban landscape. This can be a construction, structure, or space, which is constructive, constitutive, or decorative.
		13	natural element	flora or fauna	The tangible attribute represents specific flora or fauna, like water elements of/in the historic landscape produced by nature. It can be natural or designed.
	area	14	ensemble	group of buildings	The tangible attribute represents a group of buildings or specific urban ensemble or configuration. The combination generates or represents specific history, coherence, variation, significance and has recognizable relations.
		15	context	setting	The tangible attribute represents the buildings or elements surrounding, supporting, or contextualizing the actual heritage. It is situating, adds understanding, often though not necessarily geographical proximity.
		16	area	District in the wider (urban) landscape	The tangible attribute represents a district in a wider (urban) landscape, or a specific combination of cultural and or natural elements.
	all	17	layering	stratigraphy	The tangible attribute represents a landscape illustrative of the evolution or development of human society and settlement over time, a diversity of manifestations of the interaction between humankind and its natural environment.
18		landscape	everything based on significance	The tangible attribute represents the integrated whole, the wider (urban) cultural landscape including (indicated or located) elements, areas or attributes with various levels of significance.	

Appendix 2: Gutschoven and Veldapus (2016) Extended Attributes definitions table. Retrieved from





Appendix 3: Author (2023) Graduation Studio Planning